

# Simu-CIC - release notes

## Versions history

The following versions of SIMU-CIC have been issued:

Version	Date	Recommended Scilab version	Recommended CelestLab version
1.0.1	2018-11-28		
1.1.1	2019-12-20		
1.2.0	2020-09-28		
1.2.1	2021-08-02		
1.3.0	2022-10-11	6.0.2 or 6.1.0	3.4.0
1.4.0	2024-03-11	2024.0.0	3.5.0
1.4.1	2024-10-17	2024.0.0 or 2024.1.0	3.5.0
1.4.2	2024-11-06	2024.0.0 or 2024.1.0	3.5.0

## Major changes between versions 1.4.1 and 1.4.2

- Correction of anomaly: a function to be added to CelestLab soon was missing for some plots.
- Correction of anomaly: it was not possible to import ephemeris files containing position vectors only.
- The quaternion type (“FIRST” or “LAST”) in imported quaternion files is now correctly managed for both CIC and CCSDS formats:
  - CIC format: quaternion type is optional, “FIRST” by default.
  - CCSDS format version 1.0: quaternion type is mandatory.
  - CCSDS format version 2.0: quaternion type shall not be present and is assumed to be “LAST”.

## Major changes between versions 1.4.0 and 1.4.1

- GUI:
  - o New attitude law: “Sun Pointing - Earth Opt”, satellite axis pointed towards the Sun and second satellite axis pointed at best towards Earth centre.
- Input ephemeris files (CIC format, OEM, AEM, condition files) can now contain dates in ISO format (aaaa-mm-ddThh:mn:ss.xxx).
- CCSDS files for position/velocity and attitude are now accepted. Warning : the AEM version should be 1.0, and should only contain quaternions.
- New example script added for constellation definition, including computation of inter-satellite visibility results. Outputs are MEM files produced for each combination of satellites pairs in the constellation, including information about:
  - o Relative directions of satellites.
  - o Inter-satellite distances.
  - o Inter-satellites geometrical visibility indicators.

## Major changes between versions 1.3.0 and 1.4.0

- GUI:
  - o Updated labels in the “Attitude” tab:

- “Attitude laws” is now called “Satellite modes”.
    - “Attitude sequence” is now called “Mode sequence”
  - o A new document containing spacecraft models can be displayed (see help menu and spacecraft tab)
  - o The simulation duration can now be set in days or seconds.
- New CIC files:
  - o *Sat\_SATELLITE\_ANGULAR\_VELOCITY.TXT*  
-> Angular velocity vector of the spacecraft relative to the ICRF reference frame (coordinates in same frame).
  - o *Sat\_SATELLITE\_ANGULAR\_ACCELERATION.TXT*  
-> Angular acceleration vector of the spacecraft relative to the ICRF reference frame (coordinates in same frame).
  - o *Sat\_QUATERNION\_EARTH\_ROTATION.TXT*  
-> Quaternion describing the transformation from ICRF to ECEF (Earth Centered Earth Fixed) reference frames.
  - o *Sat\_INITIAL\_ORBIT\_PARAMETERS.TXT*  
-> Initial osculating orbital elements in ICRF reference frame.
- Output file “simu\_cic\_info.txt” contains additional information:
  - o Initial osculating orbital elements.
  - o Ground stations geographical coordinates and minimal elevation angles.
  - o Ground stations visibility durations.
  - o Satellite modes and corresponding fraction of simulation time.
  - o Sun visibility and corresponding fraction of simulation time.
- Input orbit ephemeris files can now contain position vectors only (velocity vectors are then obtained by interpolation).
- A new plot has been added: angular velocity vector coordinates.
- Computation of attitude transitions:
  - o Slight improvement of the algorithm (better detection of non-convergence situations)
  - o Additional messages and warnings are displayed in the Scilab console.

## Major changes between versions 1.2.1 and 1.3.0

- CIC outputs:
  - o New CIC file generated: *Sat\_RELATIVE\_VELOCITY-SATELLITE\_FRAME.TXT*  
It gives the coordinates of the velocity vector relative to Earth (hence “relative”) in the spacecraft frame.
  - o Changes in *Sat\_SATELLITE\_MODES.TXT* and *Sat\_SATELLITE\_ATTITUDE\_MODE.TXT*:  
Depending on the values of the maximum angular velocity and angular acceleration (see Specacraft -> Platform tab), intermediate attitudes may be generated. These are denoted by :
    - the name **[SLEW]** in *Sat\_SATELLITE\_MODES.TXT*
    - the code (or mode) **-99** in *Sat\_SATELLITE\_ATTITUDE\_MODE.TXT*

## Major changes between versions 1.1.1 and 1.2.1

- Interfaces/GUI:
  - o Command-line interfaces added to control the GUI via scripts.

- o Test procedure updated thanks to the scripting interface.
- o Scripting examples added.
- o Updated console menu.
- o Updated labels and messages.
- o Updated examples.
- Orbit properties:
  - o Updated definition of orbit number, now based on true argument of latitude.
- Attitude:
  - o Elementary condition on longitude added.
  - o Elementary condition on orbit number added (configurable reference argument of latitude).
  - o Custom elementary condition and attitude law added (definition via files).
  - o Attitude sequence constraints added (to avoid quaternion discontinuities).
  - o Some attitude laws renamed to make them more concise.
- CIC outputs:
  - o "DISTANCE\_SAT\_GROUND\_STATION" replaced by "DISTANCE\_GROUND\_STATION" in accordance with the CIC protocol.
  - o "SATELLITE\_ECLIPSE\_MOON" and "QUATERNION\_SA\_\*" are now compliant with the CIC protocol.
  - o Version of CIC files is now 2.0.
  - o "POS\_GROUND\_STATION\_\*\_IN\_ANTENNA\_\*" replaced by "GROUND\_STATION\_\*\_DIRECTION-SATELLITE\_FRAME". Bug fixed causing comments to not always correspond to the correct ground station.
  - o "POS\_SAT\_IN\_GROUND\_STATION\_\*" replaced by "SATELLITE\_DIRECTION-GROUND\_STATION\_\*\_FRAME" (to be compatible with next CIC protocol update). Comments now clearly indicate the clockwise azimuth convention in station frame.
- Graphs:
  - o Updated graphs: ground stations visibility
  - o Trajectory relative to ECI/ECF added.
- Miscellaneous
  - o Various general improvements.
  - o Slight changes of the examples.
  - o New script examples.